

Unit 11: Basic Logic Gates

Thursday, 15 May 2025 13:43

Logic Gates

- Digital systems that take in multiple signals
- Outputting 1 signal BASED ON A LOGIC TABLE
- A Logic gate performs a Logic Operation



A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

Truth table

Contains ALL possible combinations of Inputs & corresponding Output

How to know no. of rows required?

Use formula 2^n

Where N = number of inputs

Common Logic Gates

TEXTUAL DESCRIPTION

SYMBOL

BOOLEAN OPERATION

→ NOT Gate (AKA Inverter)

- 1 input, 1 output
- Turns LOW to HIGH and vice versa



$$X = \overline{A}$$

→ OR Gate

- 2 input, 1 output
- If EITHER inputs are HIGH, output will be HIGH



$$X = A + B$$

→ AND Gate

- 2 input, 1 output
- If BOTH inputs are HIGH, output will be HIGH



$$X = A \cdot B$$

→ NOR Gate

- 2 input, 1 output
- If EITHER input is HIGH, output will be LOW



$$X = \overline{A + B}$$

→ NAND

- 2 input, 1 output
- If BOTH inputs are HIGH, output will be LOW



$$X = \overline{A \cdot B}$$

→ XOR

- 2 inputs, 1 output
- If BOTH inputs are DIFFERENT, output will be HIGH



$$X = A \oplus B$$

→ XNOR

- 2 inputs, 1 output
- If BOTH inputs are THE SAME, output will be HIGH



$$X = \overline{A \oplus B}$$

Implementing logic Gates

- Use IC chips
- Only need to follow connections
- Possible to use switches

Universal Gates

- Gates that can be used to build all other gates
- Eg. NAND

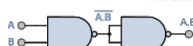
NAND Gate Symbol



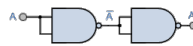
NOT Gate (Inverter)



AND Gate



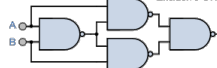
Buffer



OR Gate



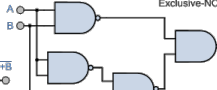
Exclusive-OR



NOR Gate



Exclusive-NOR



NOR AS UNIVERSAL GATE

